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The Honorable Jeffrey W. Runge, MD
 Administrator
 National Highway Traffic
 Safety Administration
 Room 5220
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Your Letter	
Our Ref.	2003_08_20_SV_Petition_1YO_final.doc
Date.	August 20, 2003

NHTSA - 2003 - 14345 - 12

Subject: Petition for Rulemaking, FMVSS 208 "Occupant Crash Protection" (Test Requirements with One Year Old Child Dummy); Dockets 01-11110, 00-7013

Dear Dr. Runge:

This petition for rulemaking is submitted by Siemens VDO Automotive AG (Siemens VDO). The content of this petition is based on a development co-operation with a major car manufacturer.

Petition for Rulemaking to Provide Dynamic Automatic Suppression System Certification Option for One-Year Old Child Dummy

The purpose of this petition is to request an amendment to the FMVSS 208 test requirements relating to the one year old dummy to add a dynamic automatic suppression system (DASS) option that suppresses the air bag when an occupant is out of position. Such a DASS option is already provided in the Standard for the three-year old, six-year old and 5th percentile adult female dummies. Siemens VDO believes that including the DASS option with the one-year old dummy

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could have a positive impact on motor vehicle safety by enabling the development and certification of advanced air bag suppression systems. The lack of a DASS option for the one-year old child dummy is a restriction and limitation on the development of advanced air bag technologies, because:

1. It is not possible to distinguish between a one-year old child in a FFCS and a 5th percentile female under all circumstances (e. g. while using a vision-based DASS in combination with a sun shield or a blanket). Therefore especially for small adults and children older than one year it is most likely that the air bag is suppressed even if the occupant would benefit from the air bag deployment and would not be at risk due to the distance from the air bag module.
2. A one-year old infant in a FFCS which is placed in position is not at risk as shown in the data attached to this petition. Even in extreme out of position situations (which could result from a combination of a poorly installed child seat and pre-impact braking), the measured injury criteria are below the requirements stated in FMVSS 208 for low risk deployment (see attachment). Note that these tests were performed using a current single stage air bag which was not reduced in power.
3. If a DASS option for the one-year old is available, the air bag would be deactivated when the infant enters the air bag suppression zone. An infant in a rearward facing child seat would always be treated as out of position due to its proximity to the air bag module, i. e. the air bag would not be deployed.

The preamble published with Docket 2000-7013, which issued the Final Rule of May 12, 2000, on advanced air bag systems and the preamble to Docket 2001-11110, which published the response to petitions for reconsideration on December 18, 2001, do not indicate any reason for not including a DASS option for the one-year old child dummy. This is also valid for the recent publications of January 6, 2003 (Docket 2002-14165) and January 31, 2003 (Docket 2002-14270) containing final rules and responses to petitions for reconsideration. Moreover, the option was neither included in the NPRM in Docket 98-4405 nor in the SNPRM in Docket 99-0647. It appears that NHTSA just considered this option not applicable for infants.

Specifically, the petitioning company requests NHTSA to initiate rulemaking to amend FMVSS 208, S19, to add an option to the infant protection requirements for a "Dynamic automatic suppression system that suppresses the air bag when an occupant is out of position" analogous to that provided in S21.3 and S23.3 for the three-year old and six-year old child dummies. As mentioned before, an infant in a rearward facing child seat would be treated as out of position and the air bag would not be deployed. In addition, S27.5.2 should be amended to add reference to the Subpart R twelve

month old CRABI test dummy. The DASS options for the three-year old child, six-year old child, and 5th percentile adult female dummy do not include test procedures, but there are provisions in S27 which apply to the submission of petitions for test procedures. After the publication of the final rule amendments as requested in this petition, it is planned to submit a petition for a test procedure in accordance with S27.1 (a).

Siemens VDO understands that the Standard currently enables a manufacturer to select among the various options for a particular vehicle to certify to the one-year old, three-year old, and six-year old child dummy requirements. However, in the case of the one-year old dummy, there is a clear difference in the proximity to the air bag when the dummy is placed in the rearward-facing mode under the requirements of S20.2.1.4 versus the forward-facing mode under S20.2.1.5. In fact, the forward-facing mode for the one-year old child is a misuse and contrary to the instructions given to consumers. For certification test purposes and for real-world safety, using currently available technologies, manufacturers would generally suppress the air bag when the one-year old dummy is in the rearward-facing position, but may want to permit air bag deployment in a low risk deployment mode for all forward facing occupants which are not out of position, therefore even for one-year olds. This would maximize the number of occupants which would benefit from air bag deployment while minimizing the risk for air bag induced injuries due to automatic suppression in case of out of position situations.

Assessment of Protection and Potential Injury Risks

Sled testing with forward facing child dummies in various seating positions have been done in order to answer the following three important questions:

1. What injury risk does air bag deployment present for children in forward facing child restraints?
2. Does air bag deployment provide a restraint benefit for small children?
3. Is there a risk for infants in forward facing infant seats through the air bag deployment?

Sled tests were conducted at different speeds with different seating positions. These tests were done with Hybrid III dummies representing three year old children. There were tests with two types of forward facing child seats and tests with totally unrestrained dummies. Three positions of the right front passenger seat were used: rear lower, mid-mid and front upper position. In addition there was one "misuse" condition, namely a three year old child dummy which was not fastened properly in the child seat and bent forward to model a misuse (improperly mounted child seat) in combination with "pre-impact braking". The Matrix of the sled tests is shown in attachment 1.

The overview of the results from the 35 mph (56 km/h) sled tests with the Roemer G1 booster seat is shown in attachment 2. Overall, the injury criteria are reduced when the air bag is deployed, especially when considering the neck injury criteria. Pictures from the high speed films are shown in attachments 3 and 4.

The overview of the results from the 35 mph (56 km/h) sled tests with the Roemer King child seat is shown in attachment 5. In this case the test with air bag deployment clearly showed the highest restraining potential for the occupant.

The overview of the results from the 16 mph (26 km/h) sled tests with the Roemer King child seat, but with the child in the improperly restrained, forward leaning position [misuse, out of position (OOP)] is shown in attachment 6. While the chest acceleration is increased, the neck injury criteria are strongly reduced in the tests with air bag deployment. Pictures from the high speed film are shown in attachment 7.

The overview of the results from the 22 mph (35 km/h) sled tests with a totally unrestrained child sitting in position is shown in attachment 8. All injury criteria are reduced if the air bag is deployed.

To show that a one-year old infant in position is not at risk during air bag deployment, tests with the 12 months old child dummy were conducted as static deployment tests with high output using 4 different child seats in forward facing position, i.e. the Century Encore, the Cosco Olympian, the Evenflo Horizon FFCS and the Evenflo Medaillion FFCS. Both stages of a dual stage air bag were fired with the passenger seat in the most forward / mid height position. As shown in attachment 9, all measurements remain below 25% of the injury criteria limits required in FMVSS 208. Attachment 10 shows pictures from the high speed films at different stages of deployment for the Century Encore child seat.

To evaluate the injury risk of a one-year old child in out of position situations two tests with the 12 months old child dummy were performed using the child seats Century Encore and Evenflo Horizon in forward facing positions. Both tests represent extreme misuse situations due to improper installed child seats in combination with pre-impact braking. Note that a single stage air bag of current production was deployed. Attachments 11 and 12 show pictures from the high speed films at different stages of deployment for the above mentioned child seats. Even in these situations the injury values measured do not exceed the low risk deployment injury criteria as shown in attachment 13. Furthermore, using a vision-based detection system, a dual stage air bag would have been reduced in power (LRD) or deactivated due to the proximity of the occupant to the air bag module.

Conclusions

Air bags can provide an additional restraining potential in high speed crashes for small children, who are properly restrained in child seats (even in misuse (OOP) situations). The test results show:

- Significant reductions in neck injury readings (N_{ij} , F_z)
- Partially reduction in head injury
- Slightly higher readings in chest acceleration

The restraining potential is significantly higher for properly restrained children in forward seating positions. In the high speed tests with the two CRS that were used we did not find any additional injury potential for children, even in a misuse test.

Furthermore, the injury potential for unrestrained children which are "in position" can be significantly reduced by air bag deployment.

In the low speed test simulating an OOP misuse there was little benefit from air bag deployment, reduced neck injury values are contrasted by increased HIC and chest acceleration.

Moreover, as shown by static deployment tests, there is no hazard for properly restrained one-year old infants in forward facing child seats through air bag deployment. Even in misuse out of position

situations (in which the air bag would not be deployed using a DASS option) the injury values do not exceed the injury criteria stated in FMVSS 208.

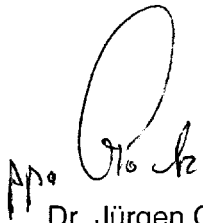
Summary

Siemens VDO requests the earliest possible consideration by NHTSA of this petition and the prompt initiation of rulemaking on the subject.

Please contact Siemens VDO for any additional information relating to this petition. If desired, we would also appreciate to perform an on-site presentation of this petition together with the data material at your Washington DC office.

Sincerely,

Siemens VDO Automotive AG



Dr. Jürgen Goetz

Executive Vice President & CEO

Restraint Systems, Safety Electronics

Regensburg, Germany



Dr. Christian Kuhrt




Manager

Cc: Stephen R. Kratzke
Associate Administrator for Safety Performance Standards
NHTSA

Attachment 1: Airbag Restraint Potential for Children

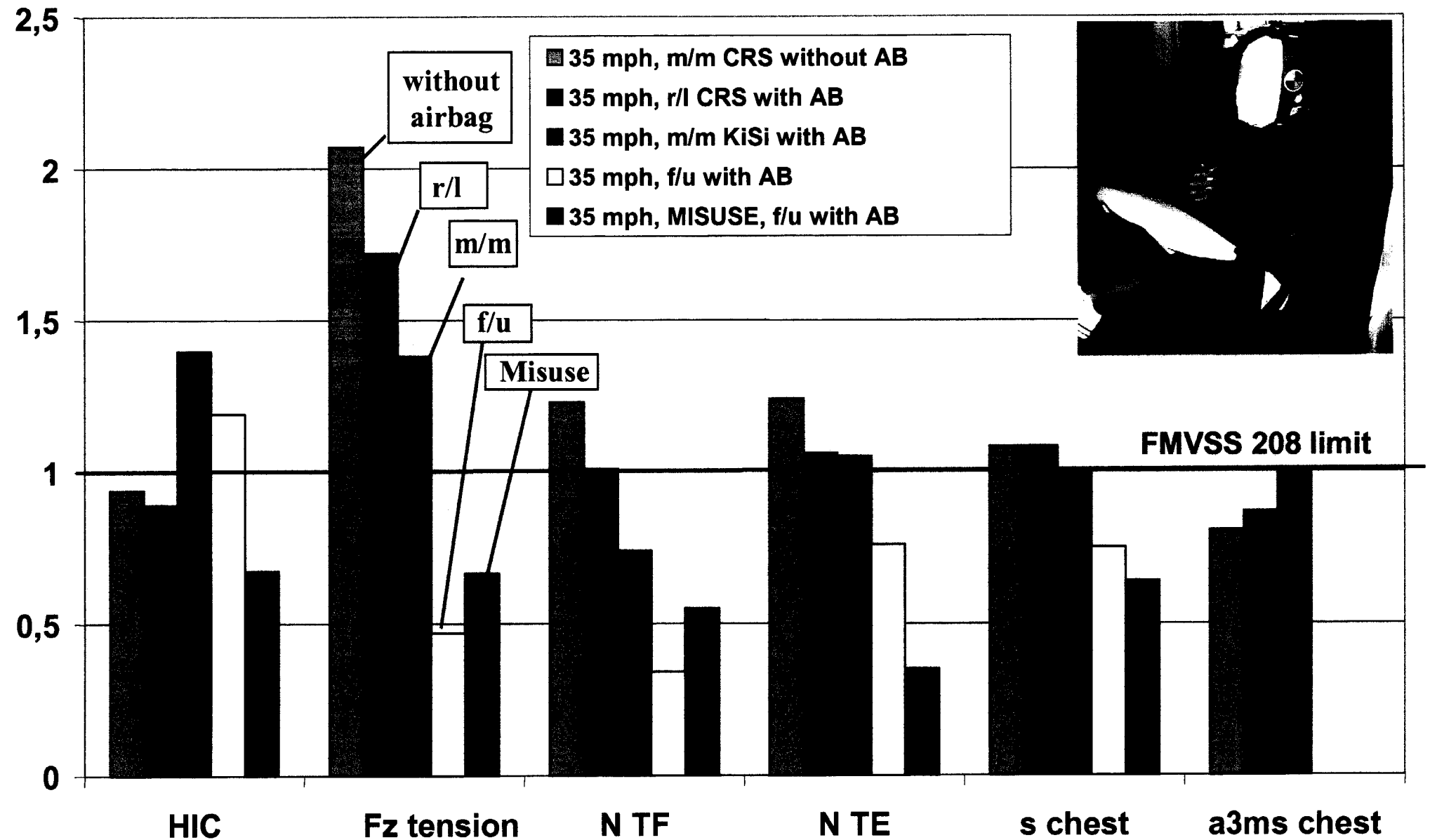
Test Matrix (Sled Tests)

✓ : test performed

seat position:		without airbag	with airbag			
		m/m	f/u Misuse	f/u	m/m	r/l
		35 mph	35 mph	35 mph	35 mph	35 mph
child restraint Römer G1		35 mph ✓	35 mph ✓	35 mph ✓	35 mph ✓	35 mph ✓
child restraint Römer King		35 mph ✓	16 mph 35 mph ✓	35 mph ✓	35 mph ✓	35 mph ✓
unbelted		22 mph ✓	OOP 208 10 mph ✓	—	22mph ✓	—

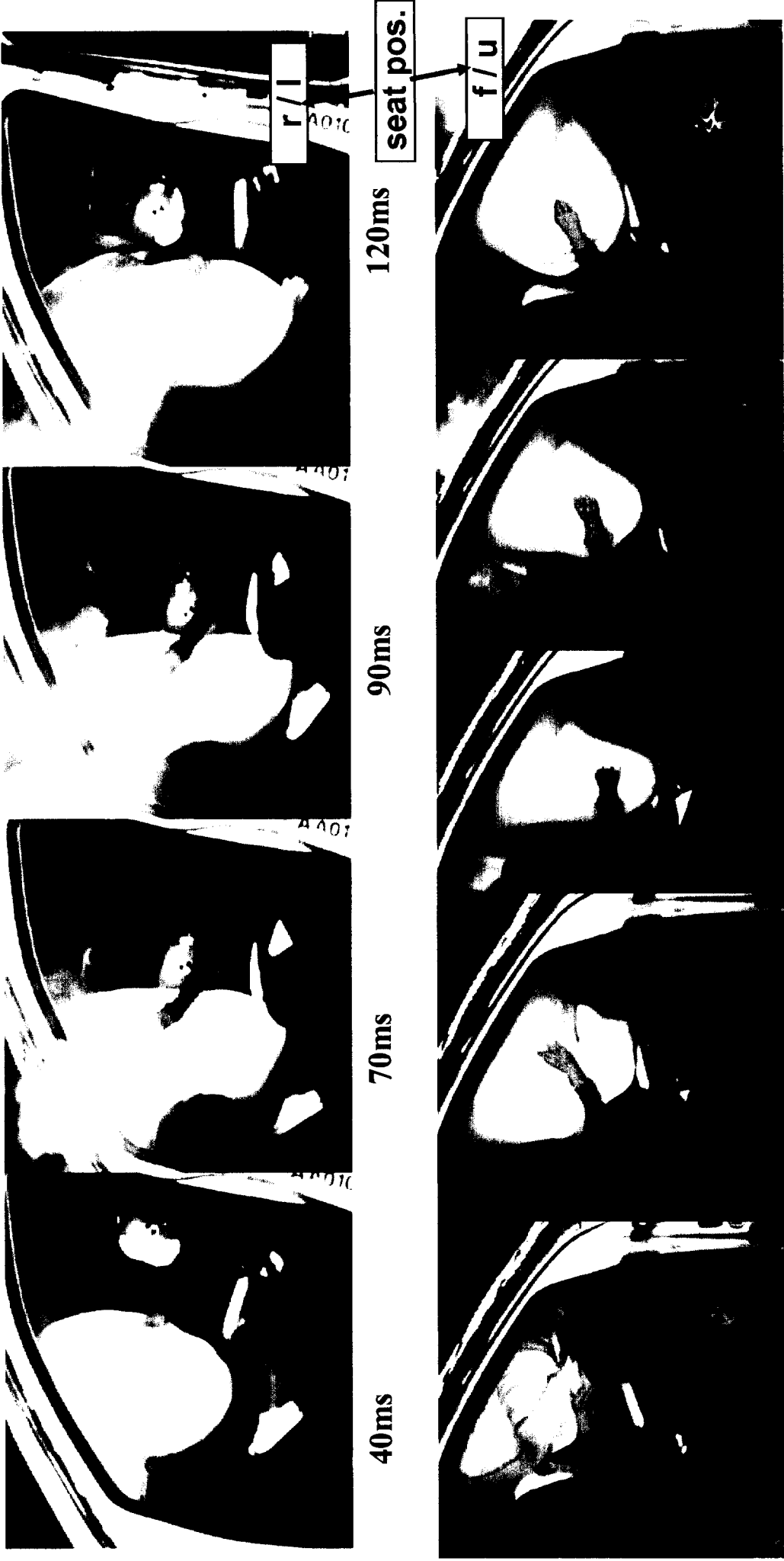
Attachment 2: Airbag Restraint Potential for Children

RÖMER G1 belted, result overview



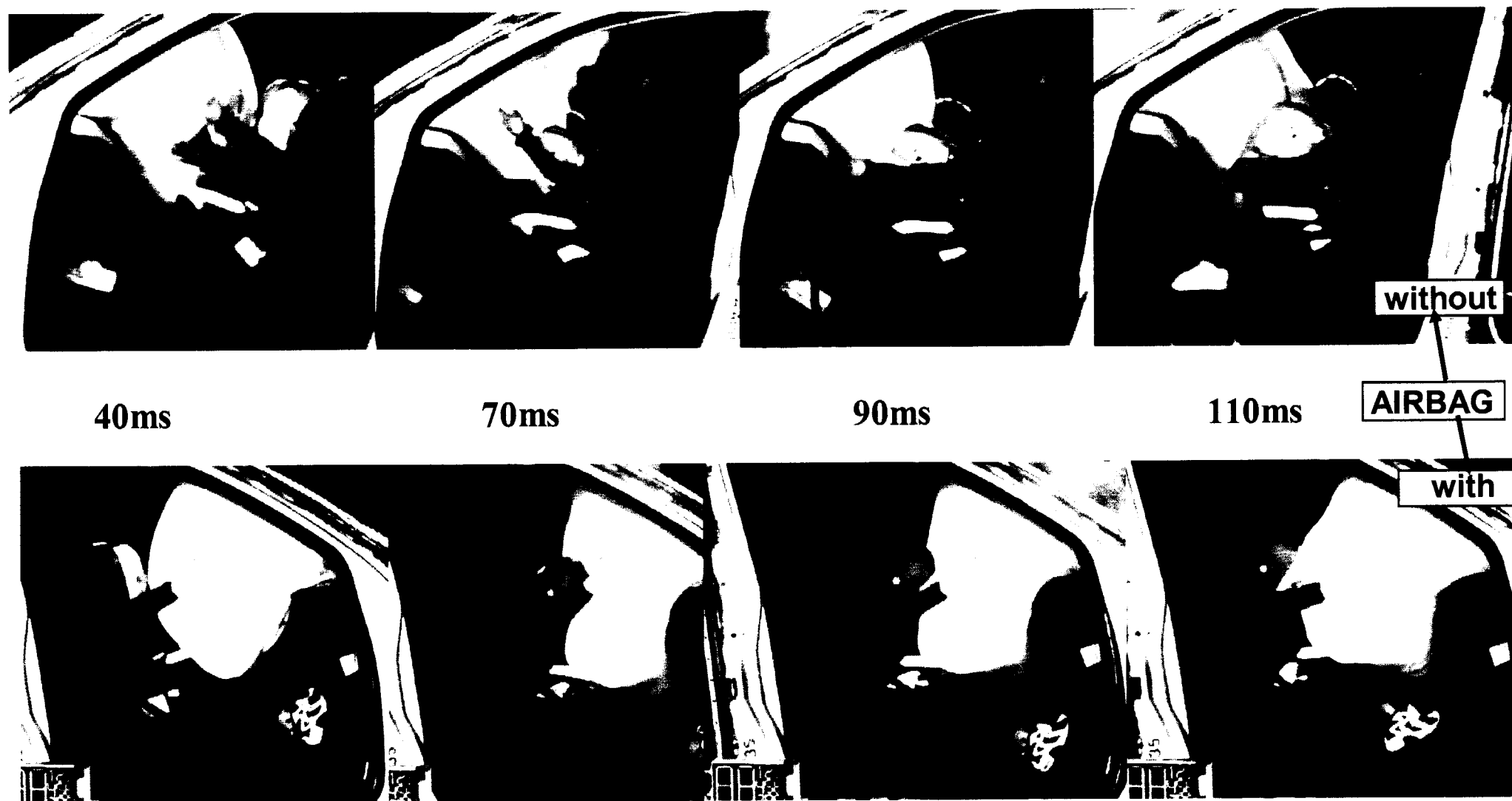
Attachment 3: Airbag Restraint Potential for Children

35 mph belted; 3YO in CRS, seat position r/l and f/u



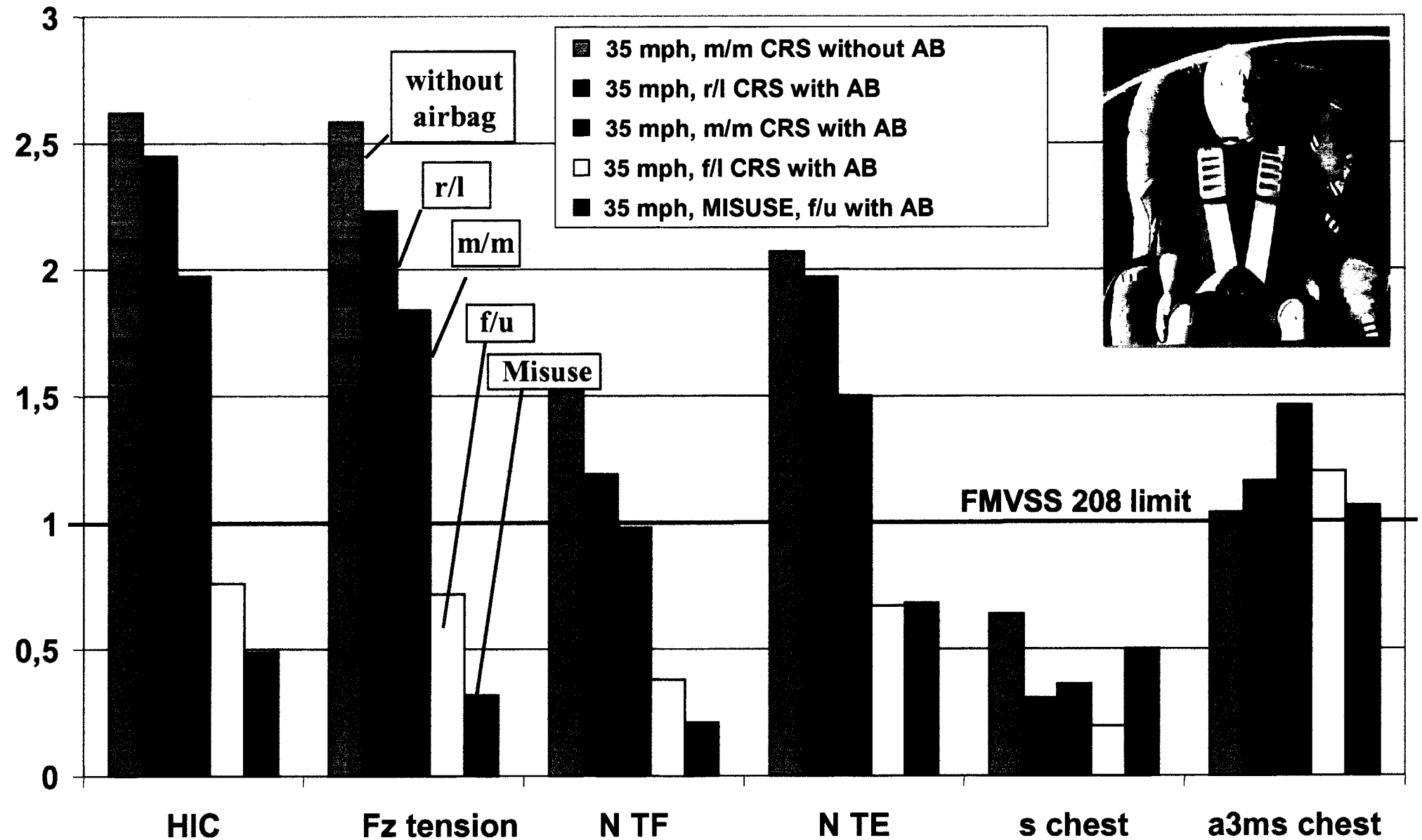
CRS: Römer G1

Attachment 4: Airbag Restraint Potential for Children
35 mph belted; 3YO in CRS, seat position m/m; with/without airbag



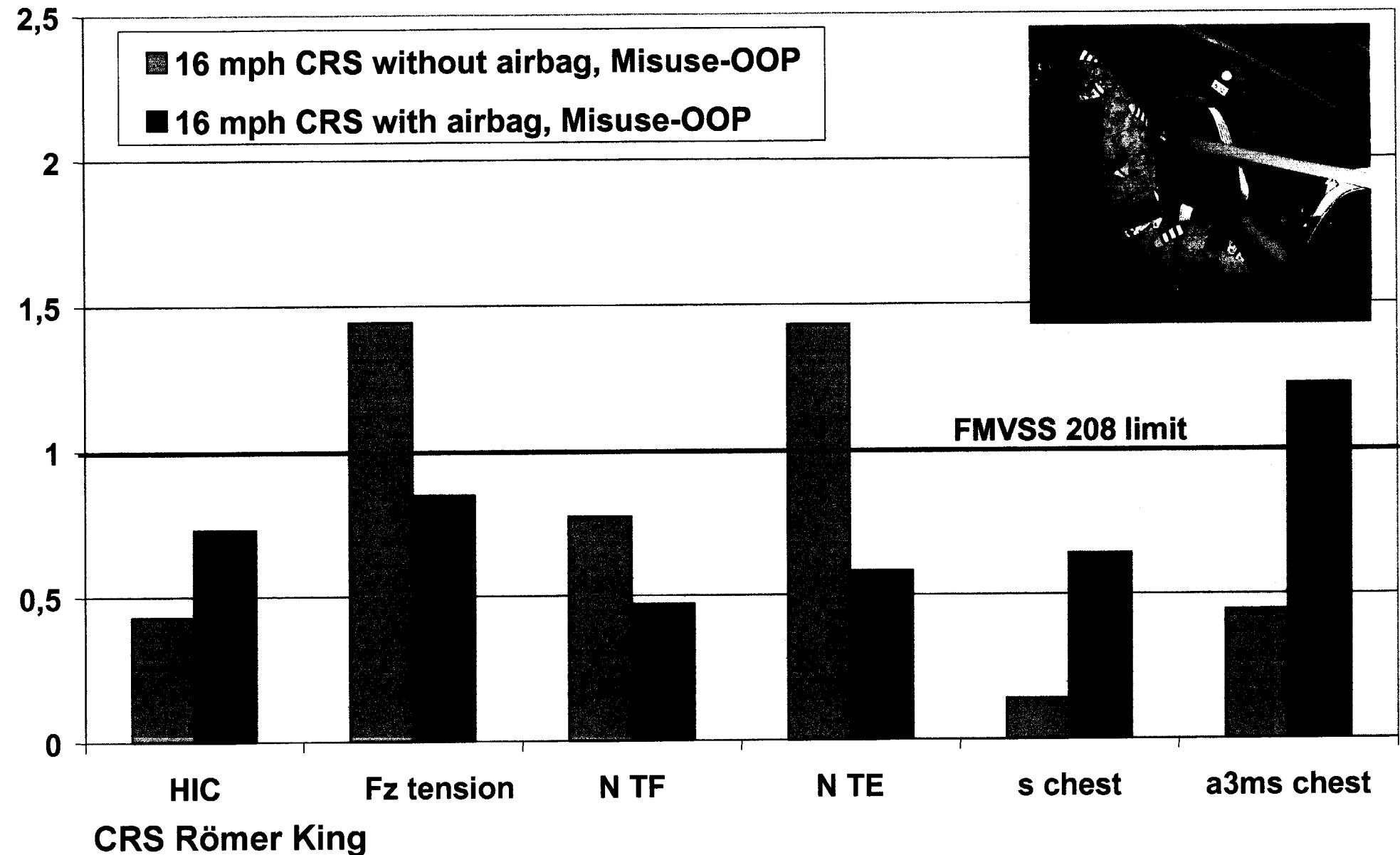
CRS: Römer G1

Attachment 5: Airbag Restraint Potential for Children **RÖMER KING belted, result overview**



Attachment 6: Airbag Restraint Potential for Children

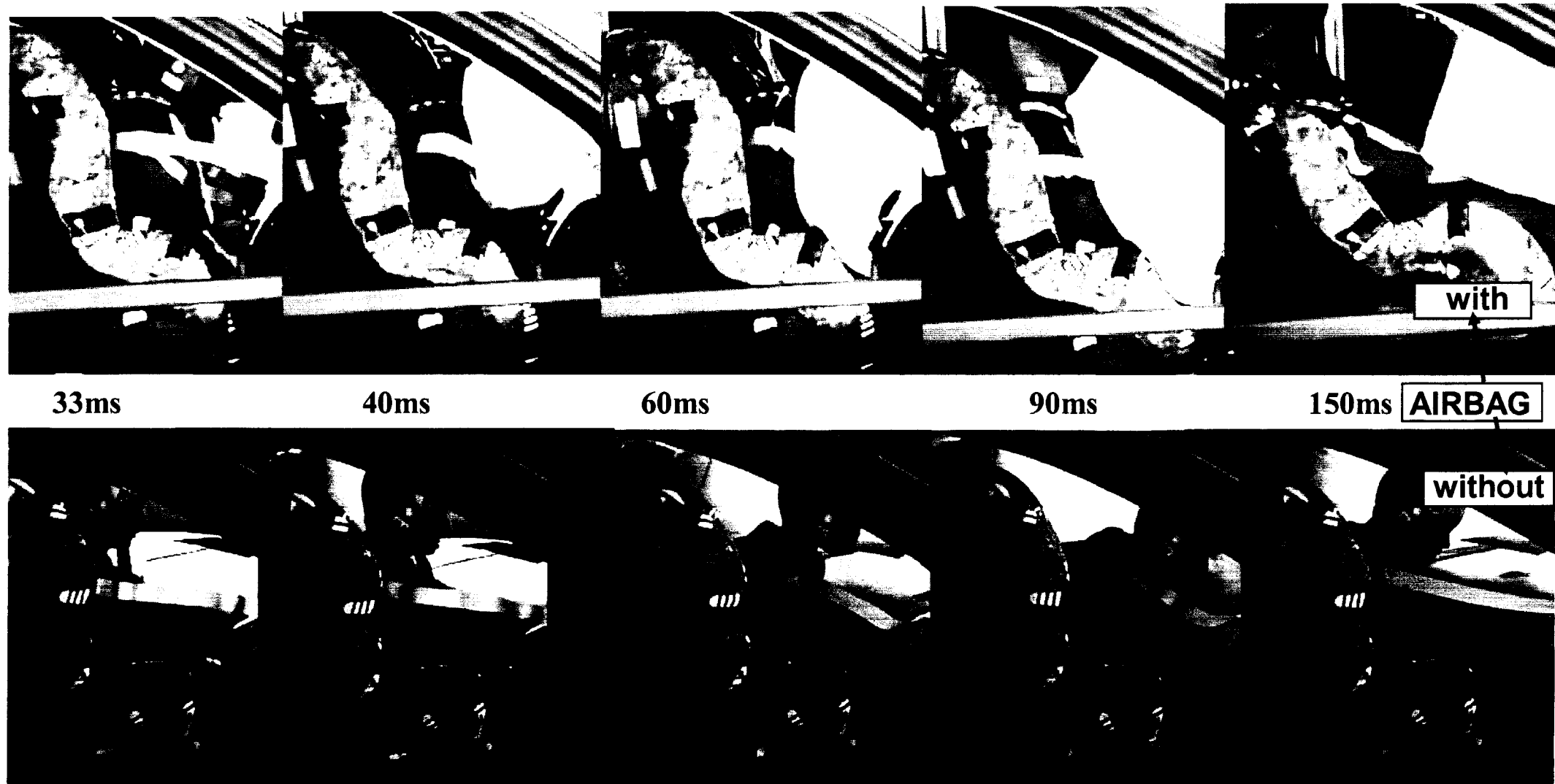
16 mph belted; 3YO in CRS, seat position f/u, MISUSE



Attachment 7: Airbag Restraint Potential for Children

16 mph belted; 3YO in CRS, f/u, MISUSE

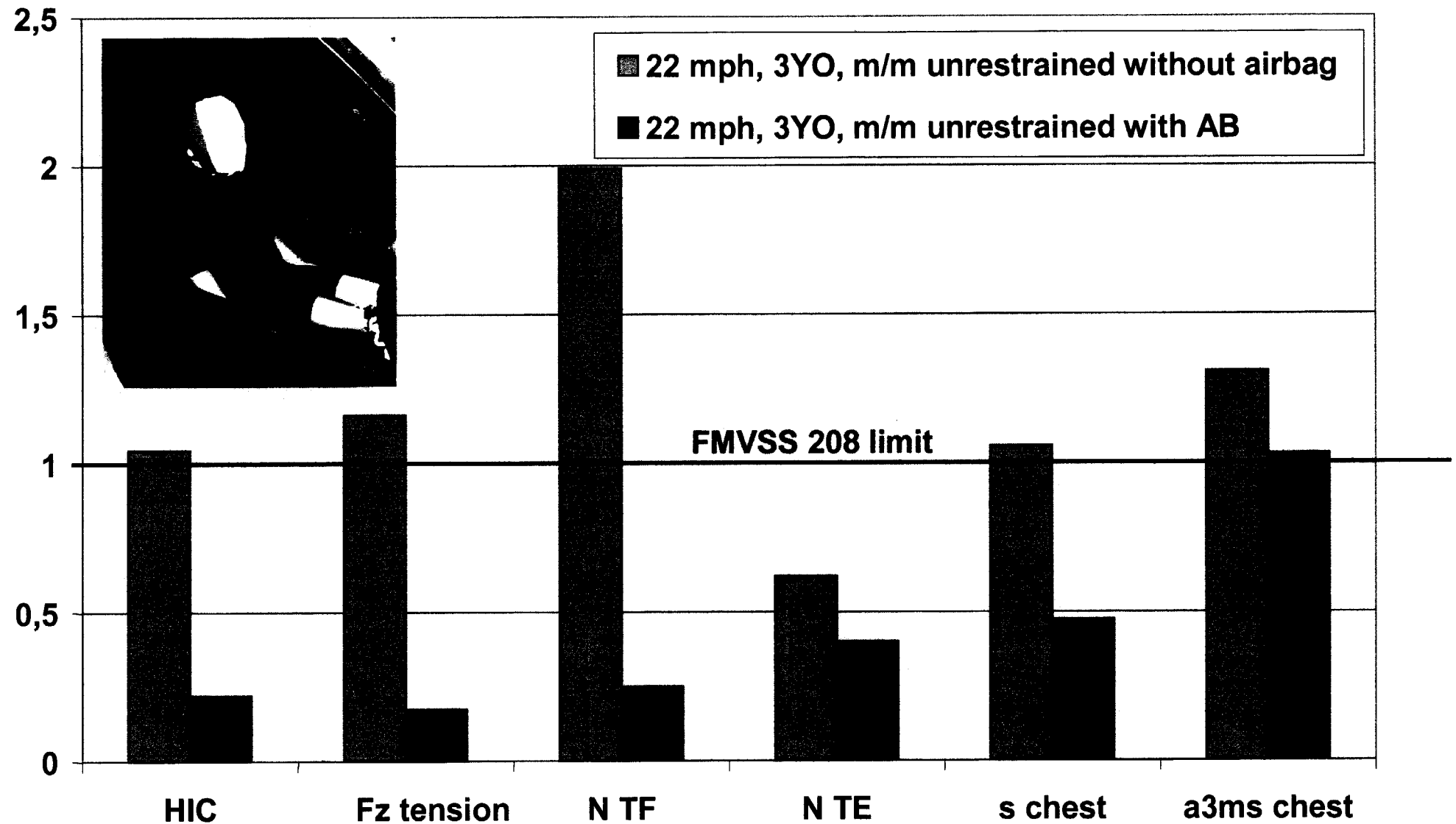
MISUSE: CRS and child not tightened correctly; child bent forward most possible



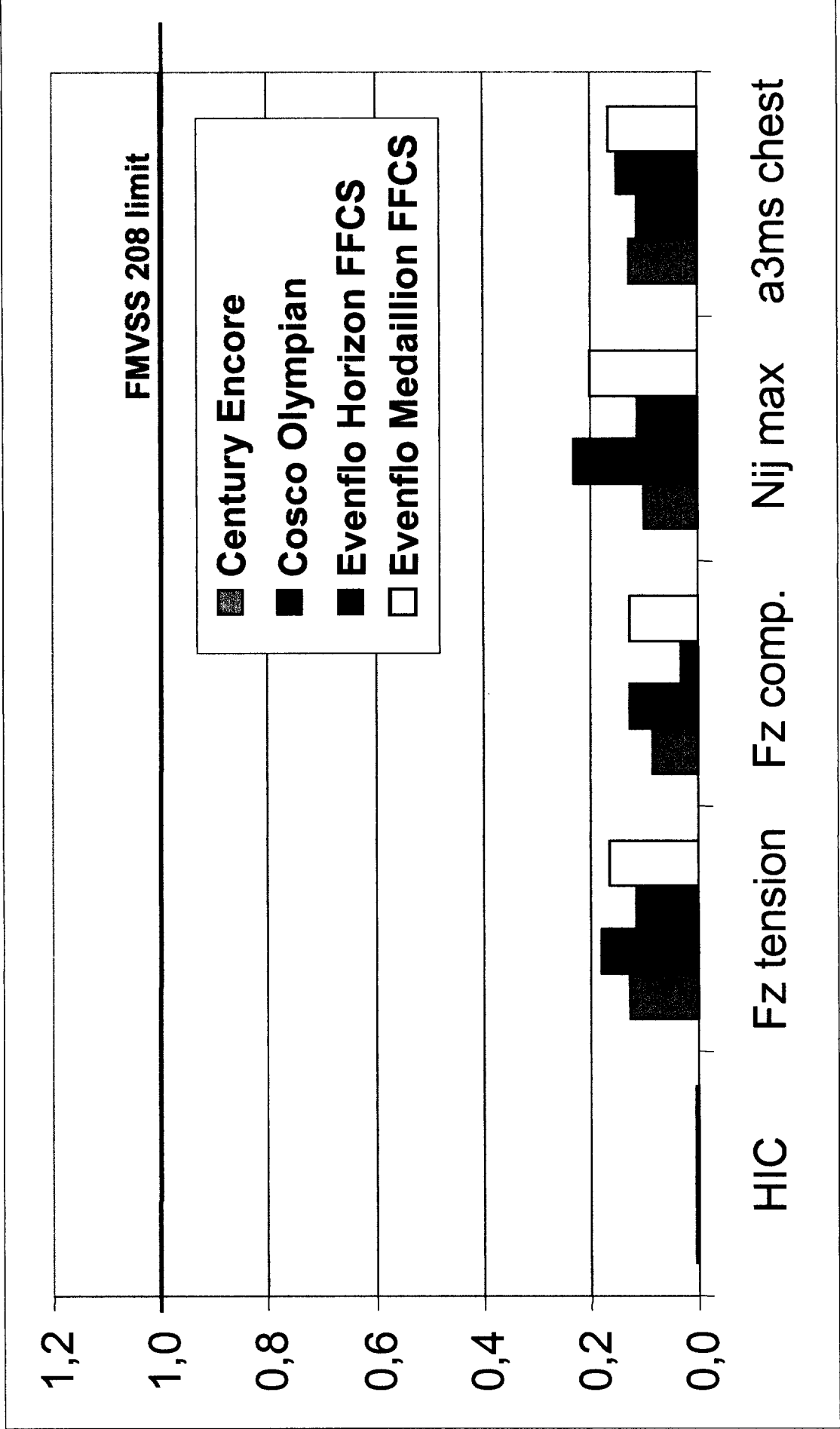
CRS Römer King

Attachment 8: Airbag Restraint Potential for Children

unrestrained; with/ without airbag



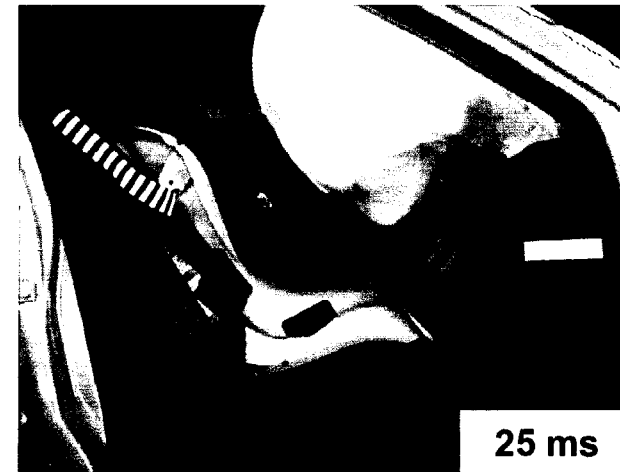
Attachment 9: Static Airbag Deployment
Test results 1 YO child in forward facing child seat



Deployment of both stages of dual stage airbag

Attachment 10: Static Airbag Deployment for 1YO Child in Forward Facing CRS

CRS: Century Encore
Seat position: most forward/mid height



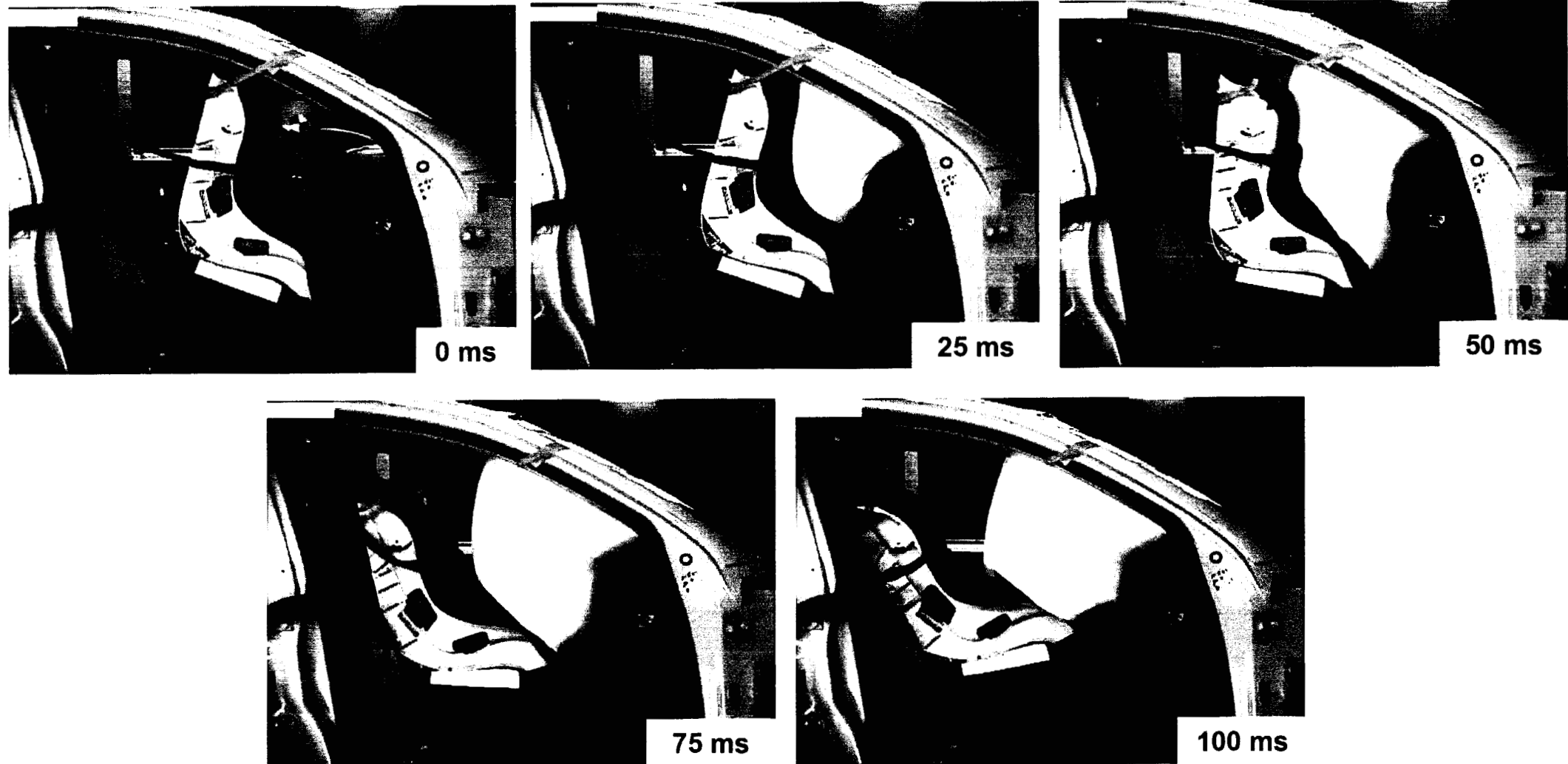
Attachment 11: Static Airbag Deployment in OOP for 1YO Child in Forward Facing CRS

CRS:

Century Encore

Seat position:

Most forward, mid height



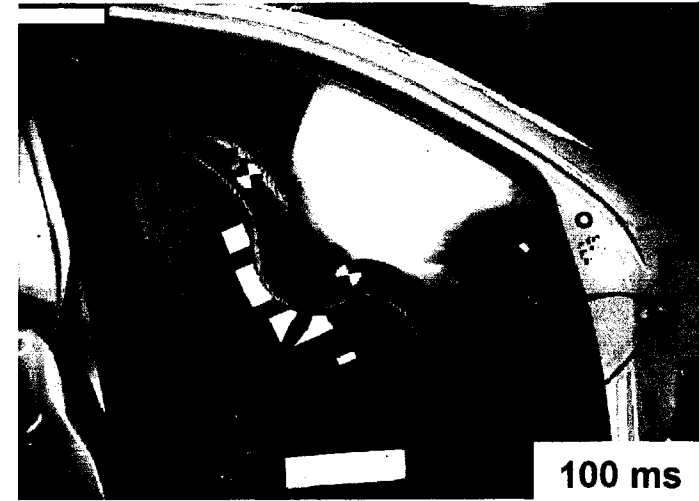
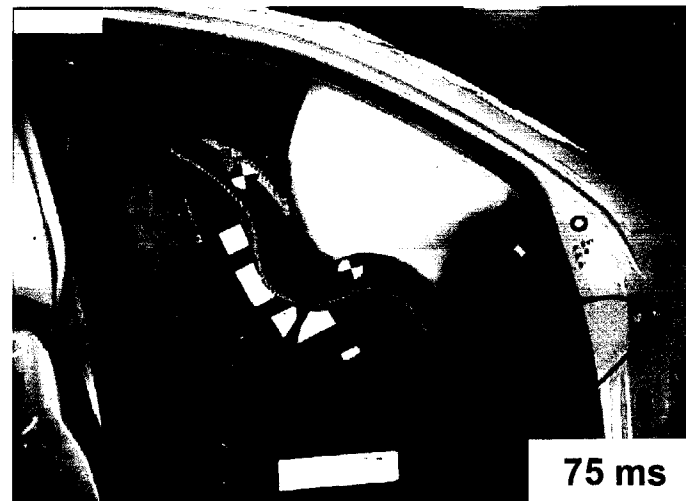
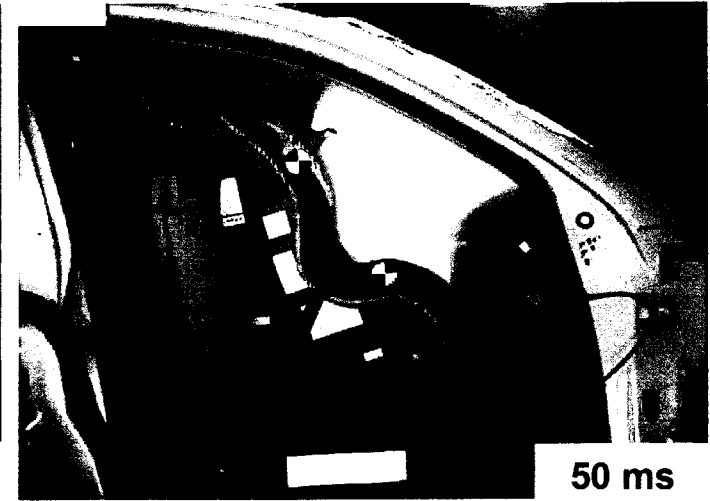
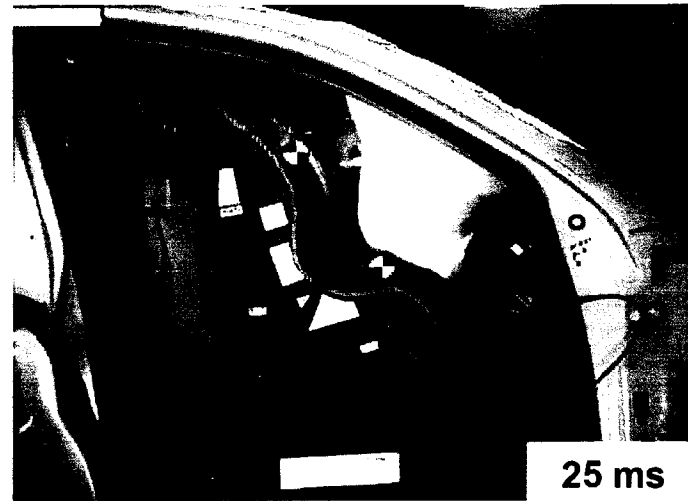
Attachment 12: Static Airbag Deployment in OOP for 1YO Child in Forward Facing CRS

CRS:

Evenflo Horizon

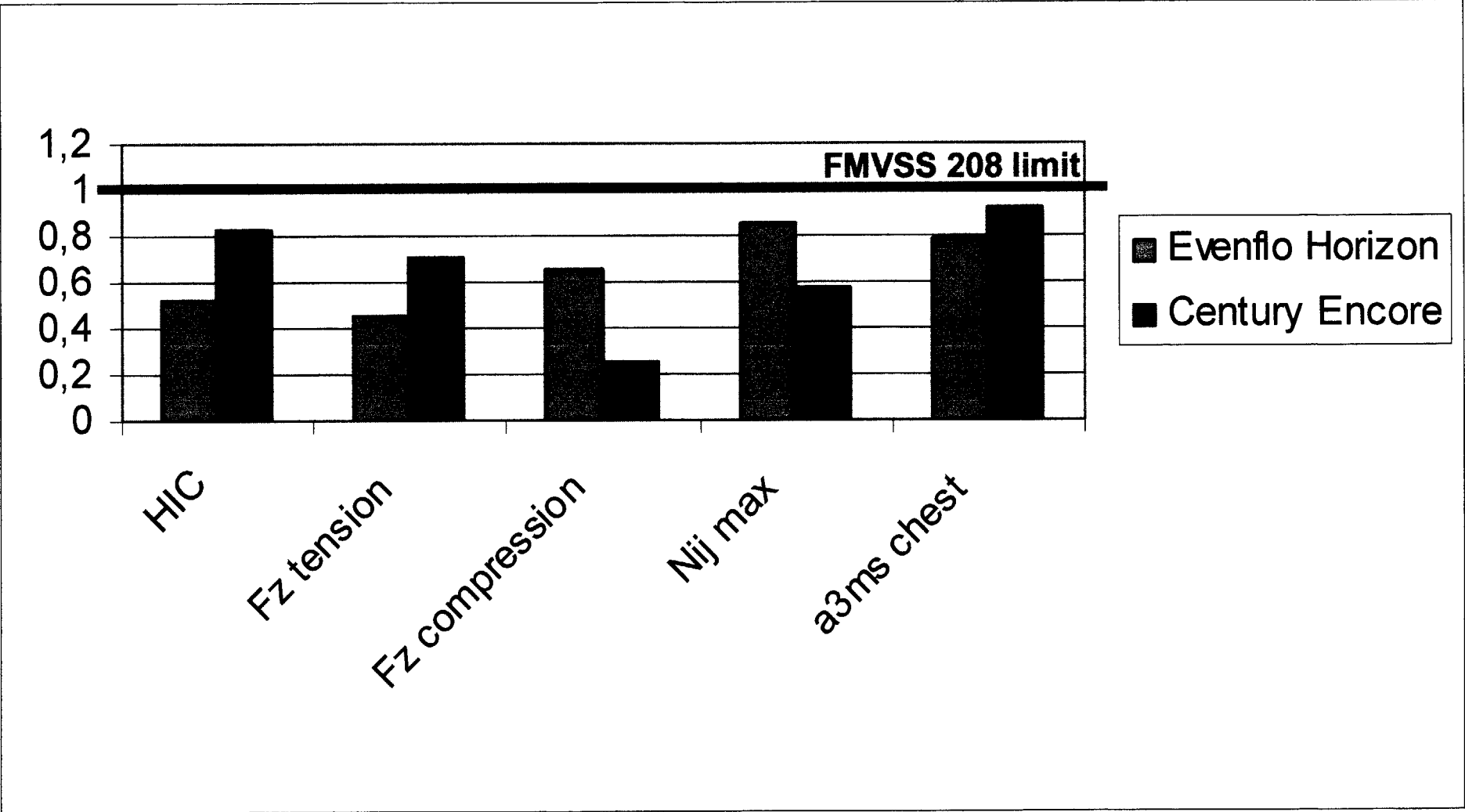
Seat position:

Most forward, top height



Attachment 13: Static Airbag Deployment in OOP for 1YO Child in Forward Facing CRS

Test results



Deployment of current state-of-the-art single stage airbag